A microcomputer-controlled system for titration analysis

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Summary

This thesis deals with the results of the implementation of microprocessor technology in automatic titration equipment to obtain a versatile system for pharmaceutical, chemical analytical and optimization research purposes.
The subject of the first part is a brief description of computers in general, computers in analytical chemistry and (micro)computers in titration analysis in particular.

The second part deals with the construction of the Intersil IM 6100 microcomputer-controlled titration system. Hardware elements developed at our own electronic department are described in chapter 2, such as the relay interface board, the pH/mV meter interface board, the burette interface board and the digital cassette recorder interface board and their connections to the elements developed at other electronic departments of the Groningen State University.
The software part of the system is the subject of chapter 3. A versatile titration program is described, which offers the possibilities of continuous and/or incremental titrant delivery, incremental delivery with fixed or calculated volume increments and several ways of equivalence point detection. Titration parameters such as waiting time, volume increment size, stability criteria and limits can be chosen in an interactive way.

The third part describes the evaluation of the system. In chapter 4 a comparison is made between three commercially available equipment burette tips and one homemade. The dynamic behaviour of the equipment in the titration process, the response time of the burette tips and diffusion characteristics are analysed using control engineering principles.
Data acquisition, data treatment and data interpretation are the subjects of chapter 5. Real time weighted digital filtering is introduced in titration analysis and the results are compared to the classical methods of equivalence point detection such as the second

derivative method and correction methods like Keller-Richter. The conclusion is that weighted digital filtering lowers the detection limit and can speed up the titration process without loss of accuracy.

The fourth part (chapter 6) deals with the pharmaceutical applications. It is a contribution to the better understanding of the activity of silver sulfanilamide compounds. The dissociation constants of sulfanilamides and the stability constants of their related silver complexes are determined. The latter was done by means of a measurement of silver and hydrogen ion concentration at the same time.